Worksheet 1 Functions of an operating system
Answers

Task 1

1. The memory of a computer is currently allocated as follows:

RAM
Process
A
B
C
D
E

Virtual memory	
Address	Process
1	A
2	A
3	D
4	D
5	D
6	E
:	
:	
:	

The tables show that parts of processes A, D and E, for example, are currently in main memory and parts of Processes B and C are also currently in virtual memory.

a) Explain why process D is mostly stored in virtual memory and not in RAM
There is insufficient RAM available to load all pages of process D as there are lots of processes running at once. / It is a large program and some pages have been swapped out when space is needed to load pages of other currently running processes.

b) What will happen if process D requires data or instructions contained within the virtual memory?
Pages from another process will be swapped out of RAM into virtual memory, and the computer will swap the required pages from virtual memory into RAM.

c) If process D needs to access data or instructions from virtual memory on a regular basis, describe how this will affect the computer's performance.
As there is insufficient RAM available to load all pages needed by the process, the computer will spend a lot of time swapping the different pages into the small space in RAM that is available. This is called disk thrashing and will cause a noticeable slowdown of the computer from the user's perspective.

d) State two ways the user could avoid the performance issues you discussed in part (c)
Install more RAM
Do not open too many processes at once / close some processes

Task 2

2 Imagine a small supermarket with one till. Customers arrive at different times, each customer has a different number of items and they get grumpy if they have to wait too long. The supermarket's aim is to keep all customers waiting for as short a time as possible.

Discuss with a partner or group:

- Which scheduling algorithm best reflects the one used by customers queuing in a supermarket? (Round Robin, First Come First Served, Shortest time remaining, Multi level feedback queues)

  First come first served

- Evaluate the benefits and drawbacks of using each scheduling algorithm for a supermarket queue.
  - Would any of them work better than the current system?
  - Do any of the algorithms benefit particular customers more than others? Consider when the customer arrives and how many items the customer has in their trolley.

  Whilst technically 'fair', **round robin** probably benefits nobody, including the supermarket! Of course, this would depend on the size of the 'timeslice' each customer was given and how many customers arrive at any one time. This is a slightly unfair comparison with the round robin processor scheduling algorithm as the time and effort taken to switch between customers in a supermarket is considerable!

  Shortest remaining time would irritate some customers as they might be interrupted half way through their shopping by a customer with fewer items. This would greatly benefit customers only buying one or two items, and greatly disadvantage shoppers with a full trolley.

  Shortest job first would effectively create a 'pool' of customers, with the next customer being called up being the one who has the fewest items. Again, this would benefit customers not buying much and could potentially cause a very long wait for customers with a large number of items.

  Multi-level feedback queues would be difficult to implement in a supermarket because a customer with a large number of items would potentially have their transaction stopped part way through and sent to the back of a different queue. Multiple queues are often seen in airport check-in desks (e.g. business class having a separate and higher priority queue than economy). However whilst these queues have different priority levels, the jobs in the queue are serviced on a first come first served basis and there is no swapping between queues.